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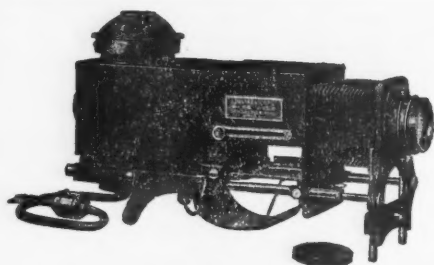
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# SCIENCE

FRIDAY, JUNE 13, 1919

## THE SCIENTIFIC SPIRIT<sup>1</sup>

### CONTENTS

<i>The Scientific Spirit: PROFESSOR MAYNARD M. METCALF .....</i>	551
<i>Scientific Events:—</i>	
<i>International Cooperation in Medicine; The Total Eclipse of the Sun; Mapping from the Air; The National Exposition of Chemical Industries .....</i>	558
<i>Scientific Notes and News .....</i>	561
<i>University and Educational News .....</i>	563
<i>Discussion and Correspondence:—</i>	
<i>Radium Production: DR. R. B. MOORE ....</i>	564
<i>Quotations:—</i>	
<i>The Future of Medicine .....</i>	566
<i>Scientific Books:—</i>	
<i>McAtee on the Natural History of the District of Columbia: DR. HARRY C. OBERHOLSER .....</i>	568
<i>Special Articles:—</i>	
<i>The Amphibioides: CARL L. HUBBS .....</i>	569
<i>The Buffalo Meeting of the American Chemical Society: DR. CHARLES L. PARSONS .....</i>	570

THE scientific spirit, while not easy to define, is a reality, differing from the artist spirit in some important elements and differing also from the usual spirit in philosophy. William James, to be sure, made philosophy almost an experimental science, and religion may be and is so treated by a few. Perhaps as good a concise statement of the scientific spirit as we have is from the pen of Paul of Tarsus, who wrote: "Prove all things and hold fast that which is good." I wish to discuss this injunction with you for a few minutes, to direct your attention to a number of conceptions and practises built into our present social system which do not successfully endure such scrutiny as Paul suggested, and finally we will refer briefly to the scientific spirit in relation to some deep issues of the war and some profound problems of the post-war period.

Science versus tradition, experiment versus conformity to convention, scrutiny versus blind faith, reason versus custom. We are all creatures of habit, mental and physical. Indeed custom lies at the root of our whole social system, and necessarily so. Community life is dependent upon the dominance of social custom. A group of individuals each of whom went his own independent and unpredictable way would not form a real community. The conservative tendency in men, the habit of thinking and doing as their fathers thought and did, is essential in enabling them to live and work together as a cooperating society rather than be a mass of contending rival units. And one of the chief services this conservatism renders to human society lies in the difficulty which it presents to the

<sup>1</sup> Address by the president of the Ohio Academy of Science, at the annual meeting of the academy, in Columbus, Ohio, May 29, 1919.

entrance and adoption of new and strange conceptions or lines of conduct. The new, whether new in idea or merely new in emphasis, must fight and must find itself and prove itself in this initial struggle, before it can prevail. This struggle for existence among social ideas is the scientific experimental laboratory for society, and the whole social experimental method is dependent upon the natural human conservatism which causes and makes intense this struggle through which social ideas must pass to be accepted.

But I wish to emphasize this evening another aspect of the matter, the value of having new conceptions to test, and the importance of an attitude of impersonal search for the truth, rather than a struggle for personal advantage. "Ye shall know the truth and the truth shall make you free," free from subservience to unwarranted custom and, especially, free from self-seeking. Is not the scientific spirit epitomized in each of these two injunctions, which are but different statements of the same ideal—"Prove all things and hold fast that which is good," "Know the truth and the truth shall make you free"? The ideal, the habit, of impersonal search for the truth is one of two essential foundations of worthy society. The other fundamental social ideal is more explicitly stated by the great Jewish teacher—"As ye would that men should do to you, do ye even so to them." Given the natural quality of conservatism in man, then the essentials to sound society are untrammelled thinking and unselfish action.

Now both of these, untrammelled thinking and unselfish action, are part and parcel of the scientific spirit. In thought, truth for the joy of the knowing; in action, loyalty to truth so far as discerned. Are not these the core of the true spirit of science?

Most social customs have had a long development. Nearly every one has had an embryological and larval and adolescent history and it is of keen interest to trace any such custom back through its successive periods to the germ from which it started. During the period of development and growth

the custom is built into society and becomes almost a part of its organization. Changing it is like changing a physiological habit, removing it involves a surgical operation. It is not difficult to understand that such customs have the strongest hold upon society and upon most individual men.

Yet it is surprisingly easy, if one cultivates the habit, to adopt a detached attitude and to view these customs as scientific phenomena to be observed and appraised without prejudice. It is still more surprising to see how many of our important social customs, when so viewed, are without scientific warrant, are indeed socially absurd. Let us instance a few such mistaken social customs in illustration.

One of the most absurd of social economic conventions is the adoption of a single metal as a MEDIUM OF EXCHANGE, though this constantly fluctuates in value like any other product. An essential feature in a good medium of exchange is, of course, stability in value, so that debts will be paid in dollars of the same worth as the dollars or other consideration received when the debt was contracted.<sup>2</sup> Society has made no attempt to secure such an unfluctuating medium, but has merely chosen the most precious metal which is found in sufficient abundance. Irving Fisher is now proposing that the government charge a varying seigniorage for the coinage of gold, less when gold is dear, more when it is cheap, and thus keep the gold dollar of constant value. This seems to be along the right line, for the usability of gold as a medium of exchange depends upon both its intrinsic value and its monetization, the latter giving it the necessary fluidity and so affecting its value apart from normal supply and demand. Fisher proposes to establish the amount of seigniorage by comparing the value of gold from time to time with the then value of a composite group of natural products—grains, coal, metals, etc. There are but two sources of wealth, natural resources on the one hand, and human labor on the other. The medium of exchange should be of constant value with

<sup>2</sup> Investments as well as debts should, of course, be here included.

relation to both of these, and grains coal, metals etc., upon the market, are a combination of natural resources and human labor. Of course ultimately the medium of exchange should be determined and regulated internationally, not nationally.

In merely taking our most valuable abundant metal as a medium of exchange, as now, we are following without effort an old custom and are making no attempt to have our medium of exchange conform to the needs of society. Instead of attempting to solve the problem, we are accepting failure, and almost all men, because accustomed to this unsatisfactory medium, accept it without question. Conservatism versus reason. The blunder involved is one of the serious financial mistakes in our socio-economic system. We can all realize in these days the difficulties that come when the value of the dollar and the value of other things part company, and the purchasing power of our incomes is decreased by a third or more.

Another, more serious, economic error is the permitting of PRIVATE OWNERSHIP OF LAND AND OF NATURAL RESOURCES. There are two sources of wealth, natural resources and human labor, and the labor is wholly dependent upon the natural resources and can not exist without them. The foundation of life is therefore the Earth and its products. The absurdity of our present system is seen in the fact that it allows a Super-Rockefeller to own the whole Earth and in consequence to own its inhabitants, involving thus a super-form of slavery. There could be no greater economic blunder than this, for it involves the very foundation of human society. Fortunately the facts are recognized by some of our keener economists and somewhat hopeful attempts are being made to withdraw from this absurd plan of economic organization and get upon a basis that will recognize that the earth belongs to all men and must be preserved to them and for them. The fact that withdrawal from a false system involves the greatest difficulties is no sufficient reason for giving up the problem.

Our economic life has become so complex

that INDIVIDUALISM in large scale INDUSTRY is no longer reasonable. Over 90 per cent. of all men who engage in business fail at some time in their lives. The great percentage of failures shows the enormous risks in industry. Therefore the rewards to successful capital must be made proportionally great. Society pays dearly in the first place for the failures, and then she has to pay unreasonably for the successes. Capital can not be led to take the great risks without inducements adequate to the risks. The present industrial system is clearly unsatisfactory. Society must find some way to relieve industry from these great risks and must then organize the rewards upon a more reasonable basis. There are two most fundamental changes imperatively demanded in our economic system: the first is public control of land and natural resources for the benefit of all mankind; the second is such organization of essential industry as will allow society itself to carry at least the major part of the risks of failure. In this way the risk of failure would be greatly decreased, also the cost of industry, in the form of the returns to the successful, would be greatly reduced, and (probably most valuable of all) there would result a better balanced human community with less economic contrast between the extremes. It is futile to attempt to dodge solving this difficult problem. We must come to it eventually. Why not approach it now?

The real problem here is to introduce into all social effort the same spirit of putting the job through for the sake of the country and the world, which we have seen so finely exemplified in the war effort of our soldiers and of our people at home. Not only we, but all of our allies, have thrilled with this spirit of devotion to country and to the service of all the world. The perpetuation and strengthening of this same spirit and its introduction into all the life of the people is the real goal in the social reorganization which we seek. Under the present system of industry labor is prone to feel it is working not for the general good, but for the profits of capital. A spirit of selfishness and unwholesome rivalry is thus encouraged. Society can never ap-

proach its true goal until conditions are so changed that the very social organization shall itself encourage the spirit of altruistic service. Our soldiers, as they went over the top, were very conscious of ravished Belgium, and even their meaner tasks were dignified by a realization of the importance and necessity of the great job of which these tasks were a part. Putting the job through for the sake of the country and of all the world, that should be the general spirit. The socialistic scheme of eliminating private profit from industry would put industry on a patriotic basis and the spirit with which our soldiers fought and our people labored and saved might well be paralleled by the spirit in industry. Let our progressive reorganization of society keep in line with this goal, each step bringing us a bit nearer to its realization. The problem, however, is no simple one, for there must be no discouragement to individual initiative.

A far less fundamental, yet a huge economic blunder is seen in the adoption of fire insurance as a substitute for FIRE PREVENTION. I have no quarrel with fire insurance as such, but we are strangely blind when we let the partial protection of the individual through fire insurance cause us to feel such security that we continue to allow the commonwealth to suffer its huge fire loss which in America amounts annually to about two thirds the cost of building the Panama Canal. In all the nations of the world combined there has never been spent all told a hundred million dollars, or anything near that sum, in the study of the problem of fire prevention, though in the United States of America alone the annual loss by fire is from two and one half to three times that amount. Of course with sufficient expert study it would be easy to devise simple and inexpensive methods of protecting all buildings against fire. Wooden buildings, or even those with paper partitions, as in the city of Tokyo, could readily be so protected that a fire should not pass beyond the room in which it originated. Forest and prairie fires might be somewhat more difficult to prevent.

Little that is really worth notice is now

being done toward remedying this great economic blunder and no one is interested in any sufficiently broad way in its discussion. A government bureau, with many millions at its disposal, should be studying the problem. But scientific study is one of the most difficult things to secure. It is comparatively easy to persuade men to act, however ignorant they may be of the data involved in their field of action, but to get men to consent to large expenditure for study of a problem is a matter of the greatest difficulty. The scientific ideal of search for data before acting does not sufficiently appeal to the average man.

Again we can instance as unwarranted the allowing of private rivalries in a matter so vital as TRANSPORTATION, whether of persons, goods or messages. Society is so dependent upon transportation that its interest are paramount. In contrast, however, we have most of us known of railways which inconvenience public business to injure their rivals or to promote their own interests.

In our country we have a conspicuous instance of economic absurdity in our system of TAXATION. In ancient days it was customary in many countries to "farm out" the taxes to private collectors, making them pay a given sum into the treasury and permitting them to keep for themselves whatever amount beyond this they could succeed in raising. But to America alone, among modern occidental nations, belongs the distinction of continuing this ancient system to the present day. Our national government exposes the American citizen, without protection, to the brigandage of forty-eight separate states, each seeking to fill its own coffers from his pocket, and oblivious of the extent to which other states may already have plundered him. Our present system puts really irresistible pressure upon each state to offer inducements to investment of the capital of its citizens at home and to penalize by taxation its investment outside the borders of the state. I used to have stock in an Illinois corporation which owned the control of a business in Wisconsin, of another in Ohio and of still another in Tennessee, and each of these subsidiary com-

panies had property in other states than that in which its works were located, these properties all being reckoned in determining the market value of the stocks of the parent and of the subsidiary companies. As a resident of Ohio I paid Ohio taxes on all of these properties, either directly, or as a part of the stock value. As a stockholder of the parent Illinois company, I paid, through them, Illinois taxes on all the properties of all the companies. I also paid similar Wisconsin taxes on all the property of the Wisconsin company including taxes on their property in other states. Through them I also paid full taxes in other states on all their real property in those states. I paid Ohio taxes on all the property of the Ohio company, wherever located, and also taxes in other states on their property in those states. Similarly I paid taxes in Tennessee on all the property of the Tennessee company, wherever located, and I also paid taxes in several other states on property of the Tennessee company in those states. Full local taxes were paid on all realty in its own locality and, through the tax on corporation stocks, one to three additional taxes were collected upon most of this property. Many pieces of property paid four taxes on full valuation. And this is comparatively a simple instance. American citizenship, different from citizenship in any other western nation, does not protect a man from exploitation by the irresponsible agents to whom the taxing power is farmed out.

Of course the determination of the principles of taxation should be national, it being left to the several states and to the lesser community units to determine only the amount of money to be raised. There is widespread complaint of the injustice of our taxation system, and many are endeavoring through action in the several states to ameliorate the conditions, but no one is effectively attacking the problem in the only place where its possible solution lies, namely, in connection with national control. Of course this grotesque feature of our politico-economic system should promptly be removed.

The allowing of traffic in ALCOHOLIC BEVER-

AGES is an economic and social blunder which happily is about to be remedied.

The use of WAR as a method of settling international rivalries and disputes we hope may be abandoned as a result of education through the great war just closed. War, the result of allowing international relations to be those of unrestricted rivalry rather than of cooperation, is of course characteristic of an early stage of development of human society. As the principle of integration comes to have fuller sway and a society of nations is established with safeguards and sanctions similar to those prevailing within the several nations, war will disappear except in the form of riot against law. The most ancient human social unit is probably the family. There have emerged the clan, the tribe, the state, and now perhaps we see the travail of the birth of the world community from which war shall be banished.

A false and unsocial principle hitherto accepted is that the possession of wealth excuses a man in some degree from SOCIAL SERVICE. An emphasized form of this same principle makes the possession of wealth entitle a man to direct the labor of other men into channels promotive of his selfish interests irrespective of the relation of this form of labor to the general welfare. Closely related is the emphasis in our legal system upon property rights and interests in contradistinction to what we may call manhood rights and interests. There are those who, with Professor Carver of Harvard, claim that social principles can be given adequate expression in terms of economics, but I believe this to be false. Economics deals with property and with labor with reference to property, all of which, as I believe, is wholly subsidiary to manhood considerations. Sociology is not only the larger field. It is more fundamental. It is not unusual to hear economics referred to as a science and sociology as an unorganized and unscientific mass of data and ideas. I'm afraid it is largely a case of the pot calling the kettle black. It is remarkable how many "established principles" of economics are not true. Sociology is the larger field, yet each is so large and so com-

plicated and involved that conclusions of much breadth in either field are unreliable when they pass beyond a few major underlying principles. The mass of detail in each field is too great for us to have much confidence that we have successfully digested it.

There are some of us who are beginning to feel that the supreme blunder of human society is in allowing UNRESTRICTED BREEDING under conditions that even encourage, in fact, a relatively large production of the less desirable types of men. But I do not care to discuss eugenics at this time.

Is this list of social blunders sufficient to emphasize my point of the need for free-thinking men who approach a subject without undue bias, gathering and weighing data impartially, testing all things in the search for the truth and holding fast that which is shown to be good, good for society, without too much thought of its relation to what may be their own selfish interests? Is it not evident that "Denmark" is not the only state in which there is much of unsoundness? Could any mental attitude be more unjustified than that which led a certain philosopher<sup>3</sup> to say—"Whatever is right"? It would be nearer true to say—"Whatever is wrong: the question is how wrong?"

The study of science, if properly conducted, and the study of other subjects by the scientific method, tend to free the mind from tradition and to lead one out into larger outlooks. One general type of scientific study, especially, seems to have this liberating, enlarging effect. I mean study in those fields of science in which the outworking from cause to effect occupies such immense, unthinkable stretches of time that the element of time loses its interest. Evolutionary studies, whether of living things or of Earth forms or stellar systems, involve such unthinkable lapses of time that the student neglects the time element and focuses his attention rather on the outworking of the principles involved. The economist or sociologist thinks usually in years or decades. The student of organic evolution, the geologist, the astronomer, rarely thinks in terms of

<sup>3</sup> Pope.

time and when he does his time is measured in æons not in years. His thought centers in the outworking of the influences in operation and not upon the time it takes them to reach their goal. The oppositions to be overcome, the delays to be met, by these cosmic forces mean little or nothing. The student in these subjects comes to despise time as an element in his problems. The field is too vast for time to be of any interest. It is the principles involved, the outworking relations between phenomena, that command his thought.

Might it not be worth while to think occasionally of our economic and social problems in this same spirit, omitting time, ignoring the oppositions to be overcome, and dwelling rather upon the underlying truths and their ultimate, logical, necessary outworking?<sup>4</sup> Truth is mighty and will prevail. When once it stands revealed, nothing can permanently stay its progress. Human prejudice and conservatism can only delay for a period, but not indefinitely. Why not do some of our social thinking in terms not of years or of decades but rather in terms of decades of centuries, freeing our minds from the shackles of the immediate with its confusion and its obstacles, and rising to the vision of things as they are and their necessary ultimate outworking? Let truth emancipate us with her free spirit, giving us to see beyond the present detail. In my twenty years of teaching I have watched many a student of organic evolution catching this broader view and learning, in his attitude to life and its problems, not to dwell wholly amid the details of the present but to appreciate as well something of the timeless march of the principles of truth.

If one has caught this idea and has spent occasional periods in the endeavor to grasp not the mass of detail but the more fundamental relations, he will find, I think, that his mind has been somewhat freed from its traditionalism. He will thereafter be a bit

<sup>4</sup> I would not imply that thinking of social problems from the timeless viewpoint should at all replace the more customary study of these problems. I urge it only as a supplement to such study.

more open-minded toward unfamiliar ideas. His natural reaction may even change from one of initial opposition to the strange, to one of interest and inquiry. Labels may lose some of their blighting command over his thought and he may lose his fear of such words as Democrat, Republican, heretic, agnostic, socialist, capitalist, conservative,<sup>5</sup> radical. The beginnings of freedom may be his.

Was there ever a time when there was more need than now for the unprejudiced spirit which shall receive with open inquiring mind the new ideas that are coming to the fore, and was there ever greater need for an impersonal unselfish spirit than in the social developments of the near future?

I fully believe that the organization of society is to be decidedly changed, that in our legal systems manhood rights and interests are to receive more emphasis in comparison with the rights and interests of property, and that selfish use of power by state or individual will be frowned upon and effectively restrained. The fight against slavery is won the world round. The fight against the special privilege of birth is already won in most countries, and through the aid of the great war will soon be won in all lands. The fight against the special and undue privilege of wealth is now fairly on and it will be a harder fight than either of the others and more searching in its test of the strength of our social bonds.

Any attempt to suppress the movement toward social rebuilding I believe not only to be foredoomed to failure in the end, but also to be extremely dangerous. Sitting on the lid beneath which is seething a deep discontent will merely delay action until the forces become beyond control, and will result in a dire explosion. Bolshevism and I. W. W. outrage will result and the civilization of the world will go into the melting pot. The great movement of the mass of mankind, the world round, toward reorganization of society upon a basis

giving to all men a more just share in the organization, the control and the rewards of industry and in the joys of life is to-day so powerful and the stimulus from the great war is so intense that all nations will be stirred to the depths. Who are we in America that we should escape our share of the world travail in the birth of the new order?

Traditional conceptions will not help us here. Self interest is no safe guide. Indeed our greatest dangers are from prejudice and selfishness. The American labor unions and organized capital must change their intensely selfish pre-war spirit if they are to cooperate successfully in the work of reconstruction. Collective bargaining for the adjustment of the interests of organized labor and capital, with no representation of and little concern for the interests of the general public, will not take us far toward the true goal.<sup>6</sup> Similarly the general prejudices of organized capital against socialistic tendencies is a hindrance to its rendering effective service in the solution of the problems. Labor's present feeling that it is working in considerable measure to increase the already undue profits of the capitalist develops an unsocial spirit, and so long as the present plan of organization of industry persists it is difficult to see how a more wholesome spirit can be engendered and fostered. The fine war service of both labor and capital shows a capacity for unselfish cooperation, if we can but reorganize society in such a way that all may feel that they are working directly for the common good and are getting a fair share of the rewards of their labor. The English labor party and such Americans as Brandeis, Wilson and Baker have their faces set toward the new day and are both open-minded and broad-minded. In such as they, not in the present spirit of American labor unions, lies chief hope of leadership. If instead of opposition to the seething social forces we may have sympathetic guidance, there is hope of progress without

<sup>5</sup> It is a question whether heretic or conservative is the label more feared among American scientists. Conservatism is out of style and is itself almost heretical.

<sup>6</sup> I recognize, of course, the moderation and large-mindedness of the university professors' union and of some, at least, of the railway men's unions and possibly of some others.

cataclysmic disaster. The tremendous energy of the forces now stirring in society is too valuable to be wasted even if we could suppress it. It should be guided into the performance of valuable work. Led off through the proper channels and connected with the reorganized machinery of society it could do great things. But it must be led to service of society as a whole and not to service of any privileged class, proletariat, bourgeoisie, or aristocracy.

Class prejudice, class rivalries, class hatreds, any organized or individual self-seeking at the expense of others, must be fought wherever found and the open unselfish mind promoted. In leading and in upholding the hands of the leaders the men of true scientific spirit will effectively serve. They will be the leaven, helping the people to understand and accept the new order. The road to the new and better order is through intelligence and altruism, through appreciation of and devotion to the truth, that is through the scientific spirit. Does this seem a tame conclusion? It is old fashioned, as old fashioned as the man of Nazareth who is still unsurpassed in clear vision into the heart of the truths underlying human relations and in unselfish devotion to the truth as seen.

MAYNARD M. METCALF

THE ORCHARD LABORATORY,  
OBERLIN, OHIO

### SCIENTIFIC EVENTS

#### INTERNATIONAL COOPERATION IN MEDICINE

ACCORDING to the London *Times* a very large sum of money has been promised to found what will amount to a headquarters of the American Medical Association in England. The headquarters are to consist of a hospital, a library, lecture theaters, and demonstration rooms, reading rooms, and so forth. American doctors will thus possess a rallying point when visiting London, and the spirit of English medicine will be made free to them in a manner impossible by any other means.

It is understood that Lord Reading has accepted the presidency of the scheme and that Mr. Taft is much interested in it. The names of Messrs. Newton Crane and Van Duzen are

also associated with the work, while the secretary of the American College of Surgeons, Dr. Franklin Martin, of Chicago, has taken a prominent part in furthering it. The new hospital may, it is hoped in some quarters, become a kind of Rockefeller Institute in London. British medical men are anxious to give all the help they can.

The forthcoming general meeting of the American Medical Association at Atlantic City is likely to be attended by, among others, Sir Arbuthnot Lane and, it is hoped, Sir Bertrand Dawson, who will thus help further to cement the friendship which now exists between the profession in the two countries.

Efforts are also being made in Paris to increase the usefulness and importance of the British Hospital there. This hospital, the Hertford, is rather small and the site has certain drawbacks. A scheme recently put forward would transfer it to a new site in the Bois de Boulogne and would considerably enlarge its scope. Speaking at an informal gathering recently, Dr. Monod, a distinguished French doctor, declared that British doctors would receive the warmest welcome in his country, and expressed the hope that French doctors would be encouraged to go to England to study. This gathering, which was presided over by Sir Bertrand Dawson, included some of the most outstanding physicians, surgeons and medical officers in the British and Colonial professions.

#### THE TOTAL ECLIPSE OF THE SUN

PROFESSOR HENRY NORRIS RUSSELL, of Princeton University, writes in the *Scientific American* as follows:

The present month is notable for the occurrence of a great eclipse, which happens on the 29th, and affords the longest view of the surroundings of the sun, while its own disk is hidden, which has been possible for many years.

At the time of this eclipse the moon is within a day of perigee, and unusually near the earth—her distance being a little less than 224,000 miles. In consequence her tapering shadow is still nearly 150 miles in diameter where it reaches the earth's surface, and observers situated within the belt, about 8,000 miles in length, over which this shadow sweeps as it crosses the earth's disk, will see a

total eclipse of unusual duration, which, at maximum, may amount to six minutes and fifty seconds.

The eclipse track is rather unfortunately situated. Beginning in the Pacific Ocean, just off the coast of Peru, it sweeps across South America, traversing the Bolivian Mountains, the forests of Brazil, and the higher lands of the eastern coast. Then it crosses the Atlantic, almost along the equator, just grazes the southern coast of the great western projection of Africa, passes temporarily out to sea again, and crosses the main part of the dark continent by way of the Congo basin and Lake Tanganyika—finally leaving the earth's surface at a point in the Indian Ocean not far from the African coast.

The region within which a partial eclipse is visible extends far northward and southward, including practically all of South America except the extreme southern tip, and all of Africa except the Mediterranean coast. The region where totality is longest lies in the Atlantic, and the maximum duration of eclipse observable from land stations is about four minutes, which is reached on the east coast of South America and the west coast of Africa. There is, to be sure, one small island in the Atlantic, lying almost in the central line of totality, where the eclipse lasts fully six minutes; but as this spot, known as St. Paul's Rocks, consists of a few jagged rocks rising to a height of 60 feet from deep water, with no anchorage and no fresh water, it is hardly an inviting station for even the hardiest astronomer, in spite of the fact that certain optimistic souls have nominated it as a way station for transatlantic airplane flights.

The climatic conditions along most of the track are unfavorable—the best chances of fine weather being on the high lands back of the eastern coast of Brazil, and in central Africa above Tanganyika. On account of the remoteness of these stations, and of the disorganization resulting from the war, few expeditions appear to be projected to view the eclipse. One English and one or two American parties, however, are likely to make the journey.

#### MAPPING FROM THE AIR

REQUESTS made to the United States Geological Survey, Department of the Interior, for information concerning the possibilities of photographic surveying from airplanes or other aircraft have recently become so numerous that it is deemed necessary to issue a statement on this subject. For two years the United States Geological Survey, which prepares and

publishes more maps than any other organization in the world, has devoted much time and labor to the study of problems to be solved in photo-aerial surveying. The camera has long been used in surveys on the ground, and the Geological Survey has been making studies to determine the best methods of using it in aerial work. Before the war the panoramic camera was employed by the Geological Survey for mapping in Alaska, and it had been widely used for photographic surveying in Canada and in Europe. Aerial photographic surveying involves no new principles, yet it differs essentially from photographic surveying on the ground, for the line of view from a camera in a balloon or an airplane is vertical, not horizontal. A complete statement of the Geological Survey's investigations in photographic mapping from the air will later be prepared for publication.

The problem of photographic surveying from the air is dominantly an engineering problem. Photographic technique is of course an essential part of the work, but it is a subordinate part, for the best photographs are valueless as map-making material unless they are accompanied by the requisite engineering data. Projections, adjustments, and other details of map-making technique are as necessary in photo-aerial surveying as in other surveying, and all map-making work should therefore be the work of experienced engineers.

Photographic mapping from aircraft is entirely practicable but it has not yet been brought to the point where it can supersede ground surveying. The science of cartography will no doubt be greatly advanced when the aerial method is perfected, but fundamental problems remain to be solved, and this fact should be recognized and all possible energy should be devoted to the solution of those problems. It is hoped that solutions of the essential problems in photo-aerial surveying will soon be obtained, and that this method will be put to practical use in map-making.

#### FIFTH NATIONAL EXPOSITION OF CHEMICAL INDUSTRIES

THE Fifth Annual National Exposition of Chemical Industries will be held this year in

Chicago at the Coliseum and First Regiment Armory during the week of September 22, and as usual there will be a number of society meetings held jointly with it.

The *Journal of Industrial and Engineering Chemistry* states that the movement to Chicago was decided unanimously last September at a meeting of the advisory committee of the exposition with the managers of the exposition for two reasons: The U. S. Army commandeered the Grand Central Palace immediately upon the close of the last exposition, to be converted into a receiving hospital, use for which has now, happily, nearly ceased. The Chicago Section of the American Chemical Society had been active in its interest in the exposition and was keenly interested in having it held in the city of Chicago; the Association of Commerce felt a keen interest in welcoming the exposition; it was the thought of all that the exposition would stimulate development along chemical lines in the Chicago district and the adjoining states.

The Advisory Committee of the Exposition consists of:

Charles H. Herty, *Chairman*, editor, *Journal of Industrial and Engineering Chemistry*.  
Raymond F. Bacon, director, Mellon Institute.  
L. H. Baekeland, member, Naval Consulting Board.

W. D. Bancroft, president, American Electrochemical Society.

Henry B. Faber, Industrial Filtration Corporation.

Ellwood Hendrick, president, The Chemists' Club.

Bernhard C. Hesse, General Chemical Company.

A. D. Little, president, Arthur D. Little, Inc.  
Wm. H. Nichols, president, American Chemical Society.

R. P. Perry, vice-president, The Barrett Company.

H. C. Parmelee, editor, *Chemical and Metallurgical Engineering*.

G. W. Thompson, president, American Institute of Chemical Engineers.

F. B. Wagner, United States Food Products Corporation.

M. C. Whitaker, president, United States Industrial Alcohol Co.

Charles F. Roth.

Fred W. Payne.

There is also added a special Chicago advisory committee consisting of L. V. Redman, W. D. Richardson, A. V. H. Mory, Carl S. Minor, F. W. Willard and Wm. Hoskins. The managers, as in the past, are Charles F. Roth and Fred W. Payne, and the general office is at 417 South Dearborn St., Chicago, Ill.

When the move to Chicago was first planned it was decided to use the largest available exposition building there, the Coliseum, which is conveniently located for the business, hotel, residence and industrial centers of the city. It soon developed that the space in the building was inadequate and shortly after the signing of the armistice when government property again became accessible, the management made arrangements to engage the First Regiment Armory for exhibits and meetings of some of the societies. The armory faces the next parallel street, which is Michigan Boulevard, and is separated from the Coliseum by only a narrow alleyway. The managers report that a considerable part of this space is already engaged, much of it by Chicago concerns, promising a creditable showing for Chicago industrial progressives.

The number of exhibitors is already larger than at the same time last year and includes many new companies who have not formerly exhibited. There are also on the list the names of regular exhibitors who have become inseparably connected with the exposition and who have become established as the bulwarks of the American chemical industry.

Of the meetings to be held in connection with the exposition a program is in preparation which includes the general meetings of the American Electrochemical Society, the American Institute of Mining Engineers and the American Ceramic Society. The Technical Association of the Pulp and Paper Industry is planning to meet with the exposition in several technical sessions. The Chicago Section of the American Chemical Society will have headquarters at the exposition

where it is probable that a meeting will be held. There are already indications that these meetings will be interesting ones. The Mining Institute is arranging a pyrometry symposium which will consider such questions as: Methods of pyrometry, industrial pyrometry, pyrometry and its relation to science. Special stress will also be laid upon the iron and steel industry by the institute. The American Electrochemical Society is planning an interesting program; so, too, is the Ceramic Society.

#### SCIENTIFIC NOTES AND NEWS

DR. WILLIAM GILSON FARLOW, professor of cryptogamic botany in Harvard University, died at his home in Cambridge on the third instant, in the seventy-fifth year of his age.

THE American Medical Association is meeting this week in Atlantic City under the presidency of Dr. Alexander Lambert, of New York City. The Congress of American Physicians and Surgeons meets in the same place next week under the presidency of Dr. Simon Flexner, director of the laboratories of the Rockefeller Institute for Medical Research.

PROFESSOR THOMAS C. CHAMBERLIN, head of the department of geology and paleontology of the University of Chicago, retires at the end of the present academic year.

THE French minister of education, acting on representations made by the Bureau of Longitudes, has named the following correspondents: George Ellery Hale, director of the observatory, Mt. Wilson, Calif.; William Wallace Campbell, director of the observatory, Mt. Hamilton, Calif.; William Snyder Eichelberger, director of the United States Naval Observatory, Washington, to replace Professor M. Foerster, disbarred from the list of correspondents as being a German subject; and Senator Righi, professor at the University of Bologna, Italy. The late Professor E. C. Pickering was for many years the only American correspondent of the Bureau of Longitudes.

SIR NAPIER SHAW has resumed the administrative duties of the directorship of the British Meteorological Office, from which he was re-

lieved in May of last year by the appointment of Colonel H. G. Lyons to be acting director for the period of the war.

A COMMITTEE has been formed consisting of colleagues, students and friends of Professor Landouzy to secure funds by subscription with which to establish a Landouzy Museum at the Paris School of Medicine and to strike off a medal in his honor.

IN view of the retirement of Professor F. P. Dunnington, of the school of analytical and industrial chemistry of the University of Virginia, the following resolution has been passed by the visitors: "Resolved, that the rector and visitors of the University of Virginia accept the resignation of Professor Francis Perry Dunnington with very sincere acknowledgment of his long, capable and faithful service to the university. The rector and visitors assure him of their confidence and good will, and wish for him a long life of continued usefulness in his career."

DR. J. C. MARTIN, assistant curator in the division of economic geology of the National Museum, has accepted a position with the U. S. Geological Survey. Mr. Earl V. Shannon has been appointed assistant curator in the department of geology of the museum.

LIEUTENANT COLONEL ALFRED H. BROOKS, geologist in charge of Alaskan Mineral Resources, U. S. Geological Survey, who has been with the American Army in France since the summer of 1917, has returned to Washington and is again taking up his geological work with the survey.

DR. ARTHUR W. DOX, after nineteen months' military service as captain in the Sanitary Corps, has returned to his former position as chief of the chemistry section of the Iowa Agricultural Experiment Station.

DR. DAVID KLEIN, formerly state chemist of Illinois, who has been serving in the Sanitary Corps with the American Expeditionary Forces in France, has been promoted from the rank of captain to that of major. He will spend part of the summer in Serbia with the American Relief Administration. Major Klein has just been appointed associate pro-

fessor of chemical hygiene in the school of hygiene and public health of the Johns Hopkins University.

MAJOR O. B. ZIMMERMAN, formerly liaison officer between the Army Engineer Corps and the Bureau of Standards, has accepted a position with the International Harvester Company in Chicago.

CAPTAIN D. L. WILLIAMS, formerly of the department of chemistry of the College of the City of New York, who has been at the American University as executive officer, has been honorably discharged and will probably go into business.

E. O. FIPPIN, extension professor of soil technology at Cornell University, has secured a leave of absence for one year, during which time he will act as director of the Agricultural Bureau of the National Lime Producers Association.

MR. CHESTER H. A. HAMMILL has resigned from the geological department of the Roxana Petroleum Company in order to undertake independent work at Dallas, Texas.

MR. JAMES M. HILL, JR., is on leave of absence from the Geological Survey, engaged in prospecting for platinum in Colombia.

DR. H. FOSTER BAIN has resigned from the Bureau of Mines and will sail from Vancouver this month to continue his explorations in China for New York mining interests.

DR. J. W. T. DUVEL, who for many years was crop technologist in charge of grain standardization investigations, Bureau of Markets, U. S. Department of Agriculture, has resigned to accept a position with the United States Food Administration Grain Corporation, at 42 Broadway, New York. Dr. Duvel was loaned to the Grain Corporation during the latter part of the war and for six months previously he made an investigation of the wheat situation in Australia for the Bureau of Markets, U. S. Department of Agriculture, and for the U. S. Food Administration.

THE Howard Taylor Ricketts Prize of two hundred and fifty dollars, awarded annually in May to the student showing the best ability in research work in bacteriology or pathology

at the University of Chicago, has been divided between Mr. Frederick W. Mulsow and Mr. Emanuel B. Fink, both of whom are doctors of philosophy. The prize is given in memory of Professor Howard Taylor Ricketts, who died in Mexico from a contagion he was investigating.

PROFESSOR B. B. BOLTWOOD, director of the Yale Chemical Laboratory, has addressed Sigma Xi of Brown University on "Radioactivity and its bearing on chemical theories."

DR. JOHN M. DODSON, dean of Rush Medical College, in affiliation with the University of Chicago, and chairman of the council on medical education of the American Medical Association, delivered the address at the commencement exercises of the medical department of the University of Texas.

At a meeting in Birmingham last week of representatives of the engineering profession and others, a provisional plan for celebrating the centenary of the death of James Watt was agreed upon. It includes the endowment of a chair of engineering at the university.

THE ninth annual May lecture of the Institute of Metals, London, was delivered by Professor F. Soddy on "Radio-activity," on May 19.

THE *Journal* of the American Medical Association states that to honor the memory of the eminent Spanish histologist, Achúcarro, whose untimely death was chronicled last year, his family has founded a prize of 1,000 pesetas to be awarded biannually for the best work that has been published in the four preceding years on normal or pathologic histology. The prize will be awarded alternately in Spain and abroad. In Spain it can be given for the best work on general biology or the total works of an author, as well as for work in histology. Abroad, the field is limited to histology of the nervous system. The board of awards consists of Professors Ramon y Cajal and L. Simarro, with the laymen, the marqués de Palomares and Severino Achúcarro. The prize is to be awarded this year to a Spanish writer.

THE opening lecture of the graduate summer quarter in medical sciences at the University of Illinois, Chicago, Ill., will be de-

livered on Monday, June 9, by Michael F. Guyer, Ph.D., professor of zoology in the University of Wisconsin, on "The transmission of eye-defects induced in rabbits by means of lens-sensitized fowl-serum."

SPECIAL exercises honoring the late President Charles R. Van Hise, '79, will be held during Commencement week on Alumni day at the University of Wisconsin, June 24.

THE death is announced at the age of sixty years of Dr. Ferdinand G. Wiechmann, a consulting chemical engineer of New York City, known especially for his work on sugar chemistry.

LAWRENCE M. LAMBE, since 1884 on the paleontological staff of the Canadian Geological Survey, has died at the age of fifty-five years.

DR. ROBERT CHAPMAN DAVIS, lecturer on botany in the University of Edinburgh, recently captain in the Medical Corps of the British Army, has died from influenza at the age of thirty-two years.

#### UNIVERSITY AND EDUCATIONAL NEWS

WE learn from *Nature* that a gift of £210,000 to the University of Cambridge for a chemical school was announced by the Vice-Chancellor, Dr. A. E. Shipley, at the meeting of the senate on May 13. Particulars were given in the following extracts from a letter from Mr. R. Waley Cohen: "It has been an immense pleasure to me to be able to write to Sir William Pope and tell him that the British oil companies have agreed to join together in a scheme for endowing a chemical school at Cambridge. The Burma Oil Co. have agreed to contribute £50,000; the Anglo-Persian Oil Co., £50,000; the Anglo-Saxon Petroleum Co., £50,000; and Lord Cowdray and the Hon. Clive Pearson between them £50,000, making the total of £200,000 which is required. Mr. Deterding, who has taken very great interest in the scheme from the beginning, has offered to make the £200,000 into guineas by adding a personal contribution of his own of £10,000."

THE University of Cincinnati has established in its college of medicine a department in industrial medicine and public health. Under the plans submitted, \$100,000 is to be raised by the citizens' committee on finance, for the support of this department for five years. The course will be started in October and will be open to graduates in medicine. A portion of the instruction will be given at the college and part at various industrial establishments along the lines now practised in the cooperative course.

THE Washington University School of Medicine, St. Louis, has been tendered the sum of \$150,000 by the General Education Board on condition that an equal amount be raised by subscription. This fund of \$300,000 is to be used for the endowment of the department of pharmacology.

THE board of trustees of the University of Tennessee voted \$100,000 to the medical school to be used for a new laboratory building to be erected in the rear of the Memphis City Hospital. The new building will have laboratories for pathology, bacteriology, chemistry and physiology.

DR. EDSON SUNDERLAND BASTIN, of the United States Geological Survey, has been appointed to a professorship of economic geology in the University of Chicago beginning on January 1, 1920.

WILLIAM WALTER CORT, A.B. (Colorado, '09), Ph.D. (Illinois, '14), who is at present on the staff of the University of California, and consulting helminthologist of the California State Board of Health, has been appointed associate in helminthology in the school of hygiene and public health, Johns Hopkins University. His work in Baltimore will begin in the fall.

RECENT changes in personnel at the North Carolina State College of Agriculture and Engineering include the resignation of Professor C. L. Newman, head of the department of agronomy, Dr. G. A. Roberts, head of the department of veterinary medicine, and Dr. F. A. Wolf, head of the department of botany. Professor Newman is connected with the Fed-

eral Vocational Education Board with headquarters in Atlanta, Ga., Dr. Roberts has accepted an appointment as veterinarian with the Rockefeller Foundation and is to be stationed at São Paulo, Brazil, and Dr. Wolf will retain his connection with the North Carolina Agricultural Experiment Station.

MR. MARTIN KILPATRICK, JR., of the division of inorganic chemistry, the College of the City of New York, has accepted a position as assistant professor of chemistry at Vassar College under Professor W. C. Moulton.

ERNEST CARROLL FAUST, A.B. (Oberlin, '12), Ph.D. (Illinois, '17), now instructor in zoology at the University of Illinois, has accepted a position with the China Medical Board, Rockefeller Foundation, as associate in parasitology, department of pathology, Union Medical School, Peking, China. He plans to assume his duties in Peking early in October.

PROFESSOR C. R. MARSHALL, professor of materia medica and therapeutics, University of St. Andrews, has been appointed to the regius chair of materia medica in the University of Aberdeen, vacant by the resignation of Professor Theodore Cash.

## DISCUSSION AND CORRESPONDENCE

### RADIUM PRODUCTION

TO THE EDITOR OF SCIENCE: In your issue of March 7, Dr. Charles H. Viol makes some comments on statements made by me in a paper presented before the American Institute of Mining Engineers at its September meeting, 1918, at Colorado Springs. The main thing to which Dr. Viol takes exception is the statement of the writer that:

In my judgment the carnotite fields will not produce more than 100 additional grams of radium element at the most—if that much. This would about double the world's present supply; but on account of the large use of radium in cancer treatment, such an amount, although large scientifically, would be small in proportion to the probable demands.

Dr. Viol states that the estimates of myself and the Bureau of Mines are based on a "very inadequate study of the carnotite region made prior to the war and before the fields had been

developed to any great extent"; and he claims that at least 500 grams of radium should be produced from carnotite.

No one can tell exactly how much radium can be produced from the carnotite fields of Colorado and Utah, and any estimate must be very approximate. To some extent, the future production will depend upon the price of radium, as a much higher price for radium would allow lower grade ore to be mined and treated. As the ore always exists in pockets of varied sizes and grades, the mining is very largely confined to outcrops, and this makes the question of an estimation of the probable amount available easier than if mining conditions were such as are met with in connection with other metals. It is true that some drilling has been done, chiefly by the Standard Chemical Company, and a higher price of radium would, of course, allow drilling to be carried on to a greater extent, which would undoubtedly give some increased production. The estimate of 100 grams which I made was based on the present price of radium. But, under no conditions, can I see the possibility of producing 500 grams of radium element from the carnotite fields, or anywhere near that amount.

In reference to our "inadequate study of the carnotite region," I may say that the first statement of the Bureau of Mines concerning these deposits was made in connection with U. S. Bureau of Mines Bulletin No. 70.<sup>1</sup> On page 42 the following is printed:

The United States possesses unique deposits in these carnotite ores. They constitute at present the largest known supply of radium-bearing minerals in the world. . . . Up to the present, very little interest has been shown by Americans in these deposits, which may not be duplicated in so far as quantity goes in any part of the world.

Up to this time, no one had made a statement of this kind concerning these deposits, but as soon as Mr. Kithil and myself went on record, there was immediately a strong tendency to "go us one better." In Volume 1, page 12, of *Radium*, published by the Stand-

<sup>1</sup>"A Preliminary Report on Uranium, Radium and Vanadium," by Richard B. Moore and Karl L. Kithil, 1913.

ard Chemical Company, we find the following signed by Dr. Brill, Dr. Viol's predecessor:

Conservative experts estimate the amount of uranium in this carnotite belt of Colorado to be about eight million pounds of  $U_3O_8$ . According to our experience, this would correspond to an amount of about 900 grams of radium, or about four pounds of pure radium bromide.

It must be remembered that our estimates have not been confined to this first survey. For nearly two years, engineers of the Bureau of Mines were constantly in the Paradox and surrounding regions in connection with the mining and ore-dressing operations of the Bureau, under its cooperative arrangement with the National Radium Institute.

This whole question came up last year at the Senate hearings on "Minerals and Metals for War Purposes." At the hearings, Mr. Flannery presented maps showing the recent drilling operations of the Standard Chemical Company, to which Dr. Viol evidently refers in his article. Mr. Flannery stated that these diamond drill operations had resulted in giving them an undoubted supply of ore for future purposes of at least 6,000 tons. The following is taken from the official report of the hearings:

Mr. Moore. Mr. Flannery, you stated that you had there probably about 6,000 tons of ore you could count on?

Mr. Flannery. Yes, sir.

Mr. Moore. May I ask about what your production of radium last year was?

Mr. Flannery. Our production of radium last year due to lack of transportation and chemicals was about 7 grams of radium.

Mr. Moore. How much ore did you use in that production?

Mr. Flannery. We used originally about 600 tons of the average ore to the gram of radium—that is 1/30 part of an ounce.

Mr. Moore. In other words, you have used about 4,500 tons of ore to get 7½ grams?

Mr. Flannery. I have not figured it out.

Mr. Moore. Therefore, your 6,000 tons would make less than 10 grams; you say you have 6,000 tons roughly blocked out there?

Mr. Flannery. You understand I am speaking now of the ore at the concentrator. Yes, sir; it takes about 600 tons, raw ore concentrated, or

about 4 to 1 to give you a gram of radium with our practise.

Mr. Moore. According to your own statement, your total supply of ore would be not more than 10 grams.

Mr. Flannery. The total supply of ore. You mean the total amount to be mined?

Mr. Moore. I mean you have blocked out that; you stated you had about 6,000 tons of ore you could count on. Assuming that to be correct, then you could get from that less than 10 grams.

Mr. Flannery: No, you must figure something on some of that being of a little higher grade. The 6,000 tons of ore will probably run 1½ per cent.

Mr. Moore. I am taking your average production of ore last year as being the average of what you could get out of this, which would mean that there are less than 10 grams that you could count on, assuming that to be correct?

Mr. Flannery. Yes.

Further down on page 402 of the hearings, Mr. Flannery makes the following statement:

As regards the production of ore, Mr. Moore and I had a little talk last Saturday, and he claimed he thought there were only 100 grams of radium in the Paradox Valley. I will take a contract for delivering 500 and put up a bond for the amount each year.

This evidence would seem to indicate that with the ore for 10 grams actually in sight, Mr. Flannery was willing to take a contract to deliver 500 grams. Of course, Mr. Flannery had other claims on which there were undoubtedly undeveloped bodies of ore; but the ore supply to which he referred was practically all that had been developed, and the amount was estimated on diamond drilling alone.

The original estimate of the Bureau of Mines was that the carnotite fields would probably yield from 100 to 200 grams of radium element. My more recent estimate represents an intermediate figure, since over 50 grams had been produced at the time it was made.

I have no criticism of the figures given by Dr. Viol in connection with mesothorium. He states however, that:

There are several points whose importance Dr. Moore and the Bureau of Mines have overlooked or minimized in their anxiety to conserve radium.

The points he refers to are as follows:

1. "The probable maximum production of mesothorium will not exceed the equivalent of 6 grams of radium per annum." I am perfectly willing to admit this, but 6 gram equivalents of mesothorium will go a long way toward relieving the present use of radium for luminous paint. This would exceed the average radium production of the Standard Chemical Company for the six years previous to 1918.

2. "The economical use of mesothorium in luminous compounds is only possible a year or two after refining." On the bottom of page 1,181 of my article on radium, referred to above, I stated: "After ripening for about a year after being prepared, it can be used for luminous paint just as efficiently as radium."

3. "For medical purposes, the short life and varying gamma ray activity of mesothorium make this product less desirable than radium." On page 1,182 of my article I state: "Mesothorium can also be used for cancer treatment, although its short life makes it much less desirable for this purpose than radium."

4. Dr. Viol prints a table to show the change of gamma ray activity of mesothorium with time. From this table, at the end of the second year, 78 per cent. of the activity has accumulated; and at the end of the ninth year, on the decay side of the curve, there is still 78 per cent. of the activity left. This would give seven years of useful life in luminous paint. In my paper, on page 1,182 I state: "Its usefulness for such purpose will last for four or five years, which is as long as is required for cheap watches, push buttons, etc."

In the same paper I make the following statement:

But as the physicians and surgeons of the country are not purchasing enough radium to make the industry a financial success, it is natural that the manufacturers should take other means of creating a demand.

The main object of my remarks to which Dr. Viol has taken exception was to try and stir up the medical men of this country as to the future supply of radium. No one can blame manufacturers for getting other uses for their product if the main use is not taken ad-

vantage of. If the surgeons and hospitals will not purchase radium, it will naturally go to luminous paint and be used for any other purpose that will create a demand. I believe that Dr. Viol would much rather sell for medical purposes than for miscellaneous uses in which the radium is lost; and the writer would most certainly prefer to see such a condition come about.

During the war, a considerable amount of the radium abroad in England, France and Germany, which previously had been used for cancer treatment, was drawn on for war purposes. Even in this country, a number of physicians sold their supply. This condition makes still more important the presentation of the facts as they are to the medical fraternity.

R. B. MOORE

U. S. BUREAU OF MINES,  
GOLDEN, COLO.

## QUOTATIONS

### THE FUTURE OF MEDICINE

YESTERDAY the British Medical Association concluded the most successful meeting in its annals. About the "atmosphere" of this unprecedented gathering there can be no mistake. It was one of serene and reasoned confidence in the future. The wisest leaders, who are also the most assured prophets, of the profession well know that it will not be given to them to enter the promised land which they see from afar. But they have stood upon the mountain tops and they have gazed upon it. That is enough. They will draw nearer to it; others who follow will cross its borders and continue the advance. None can set bounds to it, for it is infinite as the progress of human learning. This sense of its vastness, of its mystery, of its endless possibilities was the keynote of the meeting. The doctors realize that the war has opened to them a new world, and that it will be their high privilege to be able to apply to their fellow-men for all time the great store of new learning they have harvested on the battlefields of three continents. We can not pretend to review in this place the great number

of instructive papers and discussions which have filled these busy days. Some idea of them will have been gathered from the reports and the articles by our medical correspondent which we have published. But the general trend and spirit of the proceedings are sufficiently illustrated by the president's opening address. Like Sir Douglas Haig, Sir Clifford Allbutt had no new principles to announce. What he did was to restate with striking force and clearness some old principles, which occasionally appear to sink out of sight, and to show how they irradiate and inform whole masses of new facts. He does not hesitate to speak of the present as "the greatest moment in the history of medicine," or of the revelation to us that medicine has "come to a new birth." But when all is said and done, when all the magnificent examples of discovery and of interrelation have been described and arrayed, the widest and the most fundamental conclusion reached goes back from generation to generation to Coleridge, to Dante, and the schoolmen, to the greatest of the Greek thinkers. Coleridge insisted upon the interrelation of all knowledge, and invented the term "esemplastic" to describe it. "All things," wrote the great Florentine, "have order between them," and he declares that in this order lies the "form" which makes the universe like to God and in which angels see the impress of His power. The thought runs through the *Divine Comedy*, and guides him through the "gran mar doll' essere," as it does his master, Thomas Aquinas. How does it differ from the doctrine laid down by Sir Clifford Allbutt, when he tells us that "as the individual is but a link in the chain, so the human chain is a strand in the web of all living things." Our work, he says, must be upon the Aristotelian "double track" of the one into the many, and of the many into the one. The principle is old, but the facts which have to be brought under it are overwhelming in their number and in their novelty. The war has added to them enormously, and has suggested complex systems of interrelation unsuspected before, besides affording incontrovertible proofs of truths seen but dimly

until now. It is this seemingly endless progress upon lines known and established which makes medicine so fascinating to the scientific imagination. What can be more wonderful than some of the facts mentioned in this address; what more stimulating than some of the unsolved problems on which it touches? Sir Clifford dwells upon the light which modern physics throws upon medicine. He instances the electric methods of taking quantitative measurements of mechanical pressures in the circulation of the fluids of the body and in the heart, and he comes to the conclusion that apparently all biological reactions are determined by molecular structure. Above physics comes biology, but "we can not even guess at the links of the chains where physics recedes and biochemistry takes the lead." Merely to glance at the questions presented to us, he declares, is to discern "how vast is the realm of knowledge yet unconquered—nay, undiscovered." The tiny cell itself is a microcosm full of intense activities, which are beginning to emerge into the light through the labors of the mathematical physicist, of the spectroscopist, of the radiologist, and of the physical chemist. How are these new and vast worlds to be explored, and the knowledge of them adapted to the welfare of man? That is the practical problem. The yarn of biochemistry and biology, Sir Clifford says in a fine image, must be continually carried and woven into the web of the practising doctor's art. It is impossible for any man in practise, whatever his abilities and his industry, to perform the work for himself. He can not by his unassisted efforts keep pace with the great tide of fresh learning that is sweeping in upon him. There must be some intermediary between the working doctor and the men devoted to laboratory research—some middlemen, some *liaison* officers to keep them in touch—and the investigator, be it remembered, needs this touch as much as does the practitioner; the bedside and the laboratory must work hand in hand, if either is to derive the fullest fruit from the interrogation of nature. Sir Clifford is clear that in every good clinical school there ought to be a body of whole-time professors with

fully-equipped laboratories and staffs, who should be "continually irrigating the profession from the springs of the pure sciences." In that way, or in another, the problem must be solved, if English medicine is to keep its unsurpassed position in the world.—The London Times.

#### SCIENTIFIC BOOKS

*A Sketch of the Natural History of the District of Columbia, together with an Indexed Edition of the U. S. Geological Survey's 1917 Map of Washington and Vicinity.* By W. L. McATEE. Bulletin of the Biological Society of Washington, No. 1, May, 1918, pp. 142, 5 maps.

Reliable information regarding the biology of restricted areas is, for many reasons, of much value far beyond its mere local significance. The capital city of our country has been fortunate during the past century in the many famous naturalists that have either resided or studied here. The present comprehensive though succinct account of biological aspects of the region about the city of Washington is therefore most acceptable. Its purpose is to present a brief biological history of the District of Columbia, to point out the best places for field study, and to furnish geographical assistance in locating them. Thus the bulletin falls naturally into three parts: (1) A historical sketch of the various branches of natural history in their relation to the District of Columbia; (2) an account of the distribution of life in the District of Columbia region; and (3) an index to the United States Geological Survey's 1917 map of Washington and vicinity.

The history of the biology of the District of Columbia, it is interesting to note, dates back, we are told in a brief introduction, to the year 1608, and the redoubtable Captain John Smith of Pocahontas fame was the first observer. A number of early authors on general subjects have references to the animals and plants of the region.

The first information regarding the botany is by Petiver in 1698, who published some notes on animals and plants sent him from

Maryland. The first actual list of plants of the District of Columbia appeared in 1816, as a part of David Baillie Warden's "Chorographical and Statistical Description of the District of Columbia," and contained 142 species. A résumé of the progress of botanical study in the District of Columbia since that time down to the present shows a final list of 1,598 species, many of which have been described as new from local material. A short botanical bibliography includes the most important local publications.

The first insects from the District of Columbia were recorded in 1816 by Warden, but little was known of this group until 1859, when Baron Osten Sacken began the publication of his important articles on the insect fauna of the District. Many workers since his time have, like him, found the District of Columbia excellent collecting ground for insects, and the total list of species for the region is now very large, including 3,000 beetles alone. Many hundred species, chiefly diptera and hymenoptera, have been described from material collected near Washington. A partial bibliography, arranged according to orders and covering 16 pages, shows graphically the activity of local entomologists. Of other invertebrates there have been recorded from the District 90 species of mollusks, 308 species of spiders, 10 species of phalangids and 246 rotifers.

Fishes have here received more attention than any other group of vertebrates excepting birds, and the list of species now totals 94, several of which were described from specimens taken in the vicinity of Washington. The distribution of fishes in this region is made interesting by the fact that tidewater ends here, so that in addition to the freshwater fauna at least 26 species of salt-water fishes occur more or less regularly.

Of batrachians, 27 species are said to occur; and of reptiles, 36. The only poisonous snake at present extant is the copperhead, though the rattlesnake formerly lived in this region. As with the other groups, the account of reptiles and batrachians is followed by a short bibliography.

The birds of the District of Columbia have been more closely studied than any other group of vertebrates, and the present total comprises about 300 species and subspecies. The earliest list of the birds of the District of Columbia, consisting of 322 species, was published by David Baillie Warden in 1816. There are, however, scattered through the writings of earlier authors, many references to the birds of this region. A partial bibliography mentions the more important papers on the avifauna.

Of mammals there are now 41 species known from the vicinity of Washington, of which 3 were originally described from material collected here. It is of more than passing interest to note that within historic times the buffalo, elk, white-tailed deer and puma all lived about Washington.

A brief account of the history of early man in the District shows that the North American Indians inhabiting this region were of Algonquian stock, but all departed about the year 1700.

The most important part of this bulletin, at least from the standpoint of general biology, is the discussion under the "Distribution of Life in the District of Columbia Region," and particularly that relating to the piedmont plateau and coastal plain as faunal and floral provinces. The characteristics of the piedmont plateau and the coastal plain are explained, as is also the geological significance of the fall line separating them. The text-figure map showing the fall line and also the islands of coastal plain deposits within the piedmont plateau area is an illuminating addition to this discussion. The conclusion reached is that the fall line acts as a more or less definite faunal barrier, most so in the case of plants and insects. The substantiation of this statement, so far as the plants are concerned, is furnished in long lists of species restricted respectively to the piedmont plateau and to the coastal plain.

Fully as interesting from an ecological point of view is the discussion of the magnolia bogs about Washington in their relation to

the pine barrens of New Jersey. The author seems conclusively to show that a large percentage of characteristic pine barren plants are present in these magnolia bogs (so called because the swamp magnolia [*Magnolia virginiana*] is the one plant never absent from them), and to reach the apparently sound conclusion that the absence of pine barrens in the District of Columbia region is due solely to the absence of extensive areas of suitable soil deposits. These magnolia bogs, by furnishing a habitat where the typical pine barren plants are relieved from competition with the ordinary vegetation of the district, serve to preserve the survivors of the plant waves that accompanied the successive depressions of the Atlantic Coast region.

An account is given also of the other types of collecting ground about Washington, with mention of localities where such are to be found, together with some of the more desirable plants and animals to be obtained at each.

A decidedly useful feature of this bulletin is a map of the District of Columbia and vicinity in four sheets, on which, by means of close cross index lines, the old collecting spots, archeological sites, and minor topographical details have been indicated, so far as it has been possible to ascertain them. An index of 23 pages furnishes a ready means of reference. The map and its index have apparently been prepared with exceedingly great care, and will prove a boon to any one who has occasion to work on the local natural history.

Mr. McAtee has brought together an astonishing amount of important, not to say interesting, information concerning the biota of the District of Columbia, and not only will his bulletin prove a mine of riches for the local student, but will, as well, be of value to all ecological investigators.

HARRY C. OBERHOLSER

#### SPECIAL ARTICLES

##### THE AMPHIBIOIDEI, A GROUP OF FISHES PROPOSED TO INCLUDE THE CROSSOP- TERYGI AND THE DIPNEUSTI

THE typical fishes or Teleostomi (Osteichthyes) obviously form a monophyletic group,

being distinguished from the Elasmobranchii (Selachii) by: the development of true scales and of two related structures—articulated fin rays and membrane bones, the latter including an opercle covering the branchial clefts; the reduction of the interbranchial septa; the presence of a developed air-bladder or lung, of two external nostrils on each side; the lack of pelvic claspers (mixipterygia), etc. The Teleostomi, as Mr. C. Tate Regan<sup>1</sup> has recently stated, "may be arranged in two series: in the Actinopterygian series (Chondrostei and Teleostei) the duct of the air-bladder opens dorsally or dorsolaterally into the alimentary canal, the branchiostegals retain their primitive serial arrangement, and the supports of the paired fins are either in the form of a series of parallel pterygiophores each of which is segmented into a basal and a radial portion or are modified from this plan by a simple process of concentration and reduction; in the Crossopterygian series (Crossopterygii and Dipneusti) the opening of the pneumatic duct is ventral, the branchiostegals are replaced by a pair of gular plates, and the paired fins are more or less lobate, with their supports tending to the biserial arrangement with axial basalia." The first of these two series, the primary subdivisions of the Teleostomi, is known as the Actinopterygii or Actinopteri; the second series apparently has received no definite name. As both morphological and paleontological<sup>2</sup> evidence indicate the monophyletic naturalness of this group, it should receive a distinctive designation; to indicate its similarity and relationship with the primitive Amphibia, this group, comprising the Crossopterygii and the Dipneusti (Dipnoa), may be termed Amphibioidei.

The taxonomic rank to which the Amphibioidei may be assigned is largely a matter of personal opinion. The writer would classify the group in serial arrangement among other chordates as follows, leaving out of consideration several groups wholly extinct and of doubtful affinities (of these the Arthrodira or

Arthrognathi have often been regarded as related to the Dipneusti or the Crossopterygii):

*Subphylum* Euchorda.

*Superclass* Pisces.

*Class* Marsipobranchii.

*Class* Elasmobranchii.

*Class* Teleostomi.

*Subclass* Actinopterygii.

*Superorder* Chondrostei.

*Superorder* Holostei.

*Superorder* Teleostei.

*Subclass* AMPHIBIOIDEI.

*Superorder* Crossopterygii.

*Superorder* Dipneusti.

*Superclass* Tetrapoda.

*Class* Amphibia, etc.

CARL L. HUBBS

FIELD MUSEUM OF NATURAL HISTORY

### THE BUFFALO MEETING OF THE AMERICAN CHEMICAL SOCIETY

THE Buffalo meeting of the society, known as the "Victory" meeting, was held April 7 to 11 and was attended by approximately 1,100 chemists, and was one of the most enthusiastic meetings the American Chemical Society has ever held. Professor Giacomo Ciamician was elected an honorary member of the society as Italy's leading organic chemist. Publication of compendia of chemical literature and monographs was undertaken by the society and committees appointed to carry the plan into effect. The society also joined with the National Research Council in approving the formation of an International Research Council and an International Chemical Council in which all neutral nations were to be allowed to participate on the same basis as the allies. The society again took a strong stand against the free importation of chemicals and chemical apparatus for educational institutions, believing that such a privilege not only retarded the production of such materials in this country, but it also created a false impression as to the superiority of foreign-made materials. The society voted that at the Philadelphia meeting which is to be held from September 2-6, inclusive, a Dye Section of the society should hold meetings with Charles L. Reese, as chairman. The opening meeting on Tuesday, April 8, was made especially interesting by the three following addresses, which have been published in full in the May issue of the *Journal of Industrial and Engineering Chemistry*:

<sup>1</sup> *Ann. Mag. Nat. Hist.* (8), 3, 1909, p. 76.

<sup>2</sup> Dollo, *Bull. Soc. Belg. Géol.*, 9, 1895, p. 79.

Introductory remarks on *The future of American chemical industry*: WILLIAM H. NICHOLS, president, American Chemical Society.

*American chemical industries and the tariff commission*: WILLIAM S. CULBERTSON, U. S. Tariff Commission.

*German methods and our present situation*: JOSEPH H. CHOATE, JR., Chemical Foundation.

A paper by Irving Langmuir on "The arrangement of electrons in atoms and molecules" proved so interesting that, on request, it was given a second time to a large audience of several hundred, some of whom were unable to attend the first presentation.

The following symposium on "Mustard Gas" with Wilder D. Bancroft, as chairman, was also especially well attended, and although abstracts of the papers have not been furnished, the papers themselves, will be published in the society's journals.

The social affairs of the meeting and the excursions were well planned and were a credit to the energy and good fellowship of the Western New York Section. The ladies were given a round of entertainment at the local clubs, theater parties and teas, and were also prominent at the banquet. Over 800 members of the society sat down to the smoker on Tuesday evening and enjoyed the lavish refreshments and entertainment offered by the Smoker Committee. The extensive excursion program was also enjoyed on Thursday afternoon and Friday to the chemical industries of Buffalo and Niagara Falls.

#### MUSTARD GAS SYMPOSIUM

Wilder D. Bancroft, *Chairman*

*General properties*: W. D. BANCROFT.

*Mustard gas at the front* (lantern): B. C. GOSS.

*Chlorhydrine synthesis*: M. GOMBERG.

*Sulfur chloride synthesis*: J. B. CONANT.

*Manufacture of mustard gas*: WILLIAM MARSHALL.

*Tests*: A. B. LAMB.

*Accelerated hydrolysis*: R. E. WILSON.

*Permeability of protoplasm*: CLOWES, LILLIE and CHAMBERS.

*Permeability of skin*: CLOWES, MARSHALL and SMITH.

*Protective ointments*: R. E. WILSON.

*Protective clothing*: A. E. HILL.

*Protective clothing*: CLOWES, GORDON and GREENSFELDER.

*Persistence*: A. B. LAMB.

*The action exerted by antagonistic electrolytes on the electrical resistance and permeability of emulsion membranes*: G. H. A. CLOWES.

*Some reactions of mustard gas*: O. B. HELFRICH and E. EMMET REID.

#### DIVISION OF AGRICULTURE AND FOOD CHEMISTRY

W. D. Richardson, *Chairman*

T. J. Bryan, *Secretary*

*Sampling tankage and the effect of moisture on the ammonia content*: PAUL SMITH.

*Light weight vs. heavy oats*: P. F. TROWBRIDGE.

*Soft corn—its composition and nitrogen distribution*: GEORGE SPITZER, R. H. CARR and W. F. EPPLE. A study has been made of the composition of the dry matter of corn which has been prevented from maturing, because of injury by frosts. The investigation also included the distribution of the nitrogen found in both mature and soft corn. It has been found that the soft corn is high in amide nitrogen in proportion to its softness, and that the zein content is lower in about the same proportion as the amide is higher. A circular diagram is presented, showing the relative amounts of amide, zein, globulin and glutelins present in both the mature and soft corn. Less of the total proteins in mature corn was found to be zein than has been reported. A separation of the nonamines from the diamines was made by the Van Slyke method, but no great difference in the nitrogen distribution was noted between soft and mature corn. The true starch is usually thought to be higher in mature corn, but this did not prove to be the case, as the fat which seems to be made last is at the expense of the starch, whereas in soft corn the frost caught it before there was a chance for starch to be changed over to the fat, hence the fat content of soft corn was only about one half of that of the matured.

*A modified valenta test for butter*: CHARLES P. FOX.

*Heat penetration in processing canned foods*: W. D. BIGELOW, G. S. BOHART and ALLAN C. RICHARDSON.

*A further study of the DeRoode method for determining potash*: T. E. KEITT.

*The loss of moisture from sugar samples under different methods of preservation*: C. A. BROWNE and G. H. HARDIN. The loss of moisture from raw sugar samples in tin cans and glass jars, unsealed and with various methods of sealing, was determined. The daily loss from sugar in ordinary tin cans varied usually from 0.01 per cent. to 0.02 per

cent., about 40 per cent. of the loss being between cover and can and 60 per cent. through the seams of the can. The loss between cover and can could be prevented only by adhesive tape made impervious with melted wax or paraffine. The employment of corks in glass jars or bottles did not afford a tight seal. Dipping the corks in melted wax or paraffine did not prevent loss of moisture owing to the heated air in the corks producing blow holes. A second dipping usually made the corks tight. Fruit jars sealed with a rubber ring and glass cover did not make a tight container. Glass jars with ground glass stoppers prevented drying out only when sealed with melted wax or paraffine. The objection against glass containers is the breakage during shipment. The only effective metal container is a seamless swaged can with cover sealed with adhesive impervious tape; the difficulty of the method is that of making a seamless can of sufficient size.

*Diets of various birds and mammals:* W. D. RICHARDSON.

*The diets of various peoples in the light of the Vitamine doctrine:* W. D. RICHARDSON.

*The indispensability of milk in the adult diet:* W. D. RICHARDSON.

#### DIVISION OF PHARMACEUTICAL CHEMISTRY

F. O. Taylor, *Chairman*

George D. Beal, *Secretary*

*Cooperation in drug research:* F. R. ELDERED.

*Simple physical and biological models with which to study the penetration and function of drugs:* G. H. A. CLOWES.

*Western poisonous plant investigations:* O. A. BEATH.

*The U. S. P. assay for mercurial ointment:* L. F. GABEL.

*Alkaloids:* M. H. WEBSTER. Alkaloids are the active principles of plants and decomposed animal matter. Research work on alkaloids is intimately connected with the development of synthetic pharmaceutical chemicals and laid the foundation stone upon which the whole structure of organic dyes has been built. Reference is made to the discovery of alkaloids resulting from the search for those principles which differentiate the physiological action of drugs. Practical problems in the isolation and purification are discussed, and an attempt is made to trace these difficulties to alkaloidal functions in plant metabolism. Yields obtained in manufacture are compared with U. S. P. processes and the status of alkaloidal drug assay is viewed

alongside the ideals sought for in all analytical methods and results.

*The preparation of vitamine-activated fuller's earth:* ATHERTON SEIDELL and R. R. WILLIAMS.

*Further studies of the properties of the vitamine of brewers' yeast:* R. R. WILLIAMS and ATHERTON SEIDELL.

*Chloretone: trichlor tertiary butyl alcohol:* H. C. HAMILTON.

*Color standards for cottonseed oil:* H. V. ARNY. A discussion of the classification of commercial cottonseed oil samples by color and the unsatisfactory character of the methods hitherto employed. A résumé of the work previously done by the author and his pupils on standardized colored fluids and their use in colorimetry. A report on the use of these fluids in matching the color of cottonseed oil: the conclusions being that prime white, choice summer yellow and off summer oils can be matched by proper blends of normal or half-normal acidulated ferric chloride solution, half-normal acidulated cobalt chloride solution and water: the exact figures being given in the paper.

#### DIVISION OF BIOLOGICAL CHEMISTRY

I. K. Phelps, *Chairman*

R. A. Gortner, *Vice-chairman and Secretary*

*Capsaicin, the pungent principle of capsicum:* E. K. NELSON. Oxidation of methyl capsaicin (formed by treating capsaicin with di-methyl sulphate), gives veratric acid. Hydrolysis of capsaicin gives vanillyl amine (4-hydroxy-3-methoxy-benzyl-amine) and a decylenic acid. Capsaicin is found to be a condensation product of 4-hydroxy-3-methoxy-benzyl-amine and a decylenic acid. The decylenic acid, when hydrogenated, does not produce normal capric acid but an isomer of capric acid.

*The relation of the physical properties of organic compounds to their toxicity to insects:* WILLIAM MOORE. The results of a series of experiments with a large number of different chemicals show that the toxicity to insects of the vapor of an organic compound is correlated with its volatility or boiling point. The reason for this relation is due to the fact that in general a saturated or nearly saturated atmosphere is required before the vapor can gain entrance to the insect. Such an atmosphere is obtained by the use of smaller quantities of chemicals with high boiling points or low volatility. The factor of penetration is sufficient to completely mask the true toxicity due to chemical structure.

*Studies of the chemotherapeutic type upon insecticides and fungicides:* C. L. ALSBERG.

*The absence of fat-soluble: A "vitamine" in glandular fats:* A. D. EMMETT and G. O. LUKOS. Fat extracted from the pancreas, thymus and suprarenal glands with acetone and ether was incorporated in a diet that was complete for normal growth in rats, except for the absence of the "fat-soluble A" accessory. Comparing the effect of these rations with that obtained with control group where a normal diet and one lacking in fat-soluble A were fed, it was found that none of the three glandular fats contained this accessory or "vitamine." The use of the desiccated thymus in the therapy of rickets would therefore seem to bear no relation to the presence of the fat-soluble A, as has been claimed by some.

*The nutritive value of peanut and soy bean flours as supplements to wheat flour:* C. O. JOHNS, A. J. FINKS and MABEL S. PAUL. Bread containing 75 per cent. wheat and 25 per cent. of peanut or soy bean flours, together with a suitable salt mixture and butter fat, produced normal growth when fed to albino rats. These diets contained approximately 18 per cent. of protein. Normal growth was also obtained when the total protein content of the diet was only 11 per cent. Controls were made by using wheat bread as the only source of protein and the growth was one third to two thirds normal, this diet containing 11 per cent. of protein. The investigation is still in progress.

*A volumetric method for the detection and estimation of neutralizers in dairy products:* L. W. FERRIS. By the use of picric acid and a standard hydrochloric acid solution the inorganic salts are separated from the milk proteins and the ratio of the alkalinity of these salts to the inorganic phosphoric acid is determined. This ratio is fairly constant for normal dairy products and is increased by the presence of neutralizers, the increase being in proportion to the amount of neutralizer present. The ratio is determined on samples of normal and neutralized products and a formula given for calculating the amount of neutralizer in a given sample.

*Carbon monoxide—a respiration product of kelp:* SETH C. LANGDON. It was determined that the carbon monoxide in the floater of the Pacific Coast kelp, *Nereocystis luelkeana*, is a by-product of respiration and not an intermediate step in photosynthesis. This was accomplished by substituting gases of known composition for those nor-

mally present in the kelp and then by analysis noting any change in composition. Carbon monoxide was formed only when oxygen was present in the substituted gas. It was formed both in the light and in the dark. Carbon monoxide was not formed within plants which had been killed nor was it formed when macerated kelp is allowed to decompose or undergo autolysis. This formation of carbon monoxide within a living plant is unique.

*The effect of X-rays on the length of life of Tribolium confusum:* WHEELER P. DAVEY.

*The occurrence of gossypol in different varieties of Cottonseed:* C. L. ALSBERG, E. W. SCHWARTZ and E. T. WHERRY.

*Criticism of the Eckert method of determining nitrogen by the Kjeldahl method in nitro derivatives:* I. K. PHELPS.

*A discussion of the accuracy of the determination of nitrogen in organic substances by the Kjeldahl method:* I. K. PHELPS.

*Do mold spores contain enzymes?* (By title.) NICHOLAS KOPELOFF and LILLIAN KOPELOFF. The query "Do mold spores contain enzymes" has been answered in the affirmative by the experimental data herein presented. The spores of *Aspergillus niger* heated to 63° C. for 30 minutes and shaken with sterile sand, caused a decrease in polarization and in increase in reducing sugars in a 10 per cent. sterile solution in 3 hours, and continued the same changes throughout the 4-day incubation at 45° C. These results were corroborated when a 20 per cent. sugar solution was similarly inoculated. Spores heated to 100° C. caused no change (neither did an inoculation with sterile distilled water) proving that the activity mentioned above was enzymatic in nature. The enzyme present exhibited activities identical with invertase, consequently the spores of *Aspergillus niger* contain invertase. Among the practical applications of this phenomenon the deterioration of manufactured cane sugar and certain transformations in the soil are especially significant.

*The influence of ammonium hydroxide on the oxidation of acetone and on the acetone yield from the oxidation of butyric acid* (by title): EDGAR J. WILTZEMANN.

*The biological test for determining the fertilizer needs of a particular soil or crop:* R. P. HIBBARD and S. GUSHBERG.

*The quantity and composition of ewes' milk: its relation to the growth of lambs* (by title): RAY E. NEIDIG.

*An experimental study upon the impregnation of cloth with pediculicidal substances:* W. MOORE

and A. D. HIRSCHFELDER. Substances were tested by placing 1 gram on a piece of underwear cloth 6 × 8 cm. and wearing next to the skin. Small strips were cut off every 12 hours and placed in a glass vessel with lice and eggs. When 100 per cent. were killed in 24 hours the substance was regarded as active. Of 170 substances previously tested cresol was found to be the best, but killing properties lasted only 24 hours when worn. Mono-, di- and tribrom cresols were prepared. Dibrommeta cresol was active for 10 days and dichlor monobrom meta cresol for 13 days and the sodium salts of tribrominated crude cresol lasted 15 days. These outlasted any substances thus far used in practise.

## ORGANIC DIVISION

Lauder W. Jones, *Chairman*H. L. Fisher, *Secretary*

*The use of sulfur chlorides and chlorine for the production of organic acid chlorides from organic acids:* ROGER ADAMS.

*Synthesis of chlorine derivatives, III.:* R. R. RENSHAW and C. E. GREENLAW.

*Trimethyl phosphine and certain of its derivatives:* R. R. RENSHAW and F. K. BELL.

*Trimethyl arsine and its selenide:* R. R. RENSHAW and G. E. HOLM.

*Phenylimido phosgene and some reactions of formanilide:* W. LEE LEWIS and G. A. PERKINS. Phenylimido phosgene was prepared in 95 per cent. yields from thiocarbanilide by chlorinating in carbon disulphide or carbon tetrachloride solution. Phenylimido phosgene itself may be used as a solvent for the thiocarbanilide on chlorinating. No difficulty was experienced with ring chlorination and Nef's method of adding water to the reaction mixture before purification was found unnecessary. With a view to obtaining phenylimido phosgene from formanilide, it was found that chlorination in the presence of sulphur chlorides led to the formation of 2-4 di-chlor formanilide. In the presence of thionyl chloride chlorination of formanilide yields phenylamido chloroform.

*The ammono-carbonous and ammono-carbonic acids:* E. C. FRANKLIN.

*The reaction between dimethyl sulfate and benzene:* OLIVER KAMM and S. D. KIRKPATRICK.

*Contribution to the study of the relationship between chemical constitution and physiological action:* OLIVER KAMM.

*A study of some of the carbohydrates of the corn cob:* R. R. RENSHAW and W. J. SUEB.

*Synthesis and properties of certain dyes containing the furane cycle:* R. R. RENSHAW and NELLIE M. NAYLOR.

*The preparation of pure organic chemicals:* H. T. CLARK.

*Acetylene:* WILLIAM MALISOFF and GUSTAV EGLOFF.

*Ethane:* WILLIAM MALISOFF and GUSTAV EGLOFF.

*The occurrence of melezitose in honey:* C. S. HUDSON and S. F. SHEERWOOD.

*The chemistry of electrical insulators:* H. C. P. WEBER.

*The estimation of mercaptans:* R. L. KRAMER and E. EMMET REID.

*Alcoholysis as a factor in the determination of saponification values:* A. M. PARDEE and E. EMMET REID.

*1, 2-dichloroether:* E. A. WILDMAN and HAROLD GRAY. In the preparation of 1, 2-dichloroether by direct chlorination of ether it has been found that the process may be readily carried out if two precautions are observed: (1) In order to prevent the material catching fire spontaneously the ether must be at first cooled with an ice and water bath and the chlorine passed in very slowly. (2) To facilitate the escape of the hydrogen chloride formed in the reaction it is practically essential to agitate the mixture violently. Otherwise it tends to accumulate and then suddenly escape with sufficient violence to blow the contents out of the flask.

*Aromatic ethers:* J. M. JOHLIN. This paper outlines new methods for making aromatic ethers which are symmetrical, and for certain non-symmetrical aromatic ethers which have not been made heretofore.

CHARLES L. PARSONS,  
*Secretary*

(To be concluded)

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